ESA Section 7 Consultation No: 2003/00998

National Marine Fisheries Service
Endangered Species Act Section 7 Consultation
and Magnuson-Stevens Act
Essential Fish Habitat Consultation

Action Agencies: The National Marine Fisheries Service (NMFS)
U.S. Forest Service (USFS)
Bureau of Land Management
Environmental Protection Agency
U.S. Fish and Wildlife Service
U.S. Army Corps of Engineers
U.S. Parks Service
U.S. Bureau of Indian Affairs

Species/ESUs Affected: Puget Sound (PS) chinook salmon *(Oncorhynchus tshawytscha)*

EFH Affected: Pacific Salmon

Location: Washington State

Actions:
1. Issuance of Permit No. 1335 Modification 3 to the USFS.
2. Issuance of Permit No. 1369 Modification 1 to the King County Department of Natural Resources and Parks (KCDNRP)

Consultation Conducted By: Protected Resources Division (PRD) of the Northwest Region, NMFS (Consultation Number 2003/00998)

Approved By: ~~for~~ D. Robert Lohn, Regional Administrator

Date: **September 24, 2003** (**Expires on:** December 31, 2006)

This biological opinion (Opinion) is NMFS' review of two proposed Endangered Species Act (ESA) section 10(a)(1)(A) permit actions described below, prepared in accordance with section 7 of the ESA of 1973, as amended (16 U.S.C. 1531 et seq.). This Opinion is based on information provided in the applications for the proposed permits, comments from reviewers, published and unpublished scientific information on the biology and ecology of threatened salmonids in the action area, and other sources of information. A complete administrative record of these consultations is on file with the NMFS' Northwest Region (NWR) in Portland, Oregon.

NMFS concludes that issuing the proposed ESA section 10(a)(1)(A) permits discussed in this biological opinion is not likely to jeopardize the continued existence of threatened PS chinook salmon. Further, the action is not likely to adversely affect any designated EFH.

CONSULTATION HISTORY

NMFS proposes to issue two permit modifications authorizing scientific research studies of threatened PS chinook salmon in the Puget Sound region from the North Fork Nooksack River to the Elwha River on the Olympic Coast in the state of Washington. NMFS grouped them in a single consultation pursuant to 50 CFR 402.14(c) because the proposed actions are similar in nature and will affect the same threatened species in the Puget Sound region. The consultation history for each of the permits is summarized below.

The permit modification request for permit 1335 was received on January 29, 2003, and the request for modification to permit 1369 was received on June 4, 2003. The applications were determined to be complete and then notice was published in the *Federal Register* asking for public comment. The public was given 30 days on each application, and once that period closed, the consultation began. The full consultation histories for both actions are lengthy and are not directly relevant to the analysis for the proposed actions so they will not be detailed here. Nonetheless, the PRD in Portland, Oregon maintains the complete histories for each proposed action in the administrative record for this consultation and for each permit.

DESCRIPTION OF THE PROPOSED PERMITS

Elements Common to Research Permits

Some of the activities identified in the proposed permit actions will be funded by Federal Agencies listed above. These agencies are also responsible for complying with section 7 of the ESA because they are funding activities that may affect listed species, therefore this consultation examines the activities they propose to fund and thus will fulfill their section 7 consultation requirements.

The two permit modification actions considered in this Opinion would be in effect for the duration of the permits which expire December 31, 2006.

When a permit holder[1] does not expect to unintentionally kill any juvenile PS chinook salmon during the course of his or her work, NMFS normally sets an unintentional mortality figure at two percent of expected take. The reason for this is that on occasion unforseen circumstances can arise and, based on years of research experience, NMFS has determined it is best in these

[1] Permit Holder means the permit holder, any employee, contractor or agent of the permit holder.

instances to include modest overestimates of expected take. By doing this, NMFS gives researchers enough flexibility to make in-season research protocol adjustments in response to annual fluctuations in environmental conditions—such as water flows, larger than expected run sizes, etc.—without having to shut down the research because the expected take was exceeded. Also, high take estimates are useful when NMFS analyzes the effects of the actions, allowing accidents that could cause higher-than-expected takes to be included in the analysis.

Research permits list conditions to be followed before, during, and after the research activities are conducted. These conditions are intended to: (a) ensure compliance with the ESA; (b) manage the interaction between scientists by requiring coordination of research activities between permit holders and between permit holders and NMFS; (c) require measures to minimize impacts on target species; (d) and report information to NMFS on the nature and impact of the research activities on the species of concern.

ESA Section 10(a)(1)(A) Scientific Research Permit Terms and Conditions

The following conditions will be in all permits and permit modifications. In all cases:

1. The permit holder must ensure that listed species are taken only at the levels, by the means, in the areas and for the purposes stated in the permit application, and according to the terms and conditions in this permit.

2. The permit holder must not intentionally kill or cause to be killed any listed species unless the permit specifically allows intentional lethal take.

3. The permit holder must handle listed fish with extreme care and keep them in cold water to the maximum extent possible during sampling and processing procedures. When fish are transferred or held, a healthy environment must be provided; e.g., the holding units must contain adequate amounts of well-circulated water. When using gear that captures a mix of species, the permit holder must process listed fish first to minimize handling stress.

4. The permit holder must stop handling listed juvenile fish if the water temperature exceeds 70 degrees Fahrenheit at the capture site. Under these conditions, listed fish may only be visually identified and counted.

5. If the permit holder anesthetizes listed fish to avoid injuring or killing them during handling, the fish must be allowed to recover before being released. Fish that are only counted must remain in water and not be anesthetized.

6. The permit holder must use a sterilized needle for each individual injection when passive integrated transponder tags (PIT-tags) are inserted into listed fish.

7. If the permit holder incidentally captures any listed adult fish while sampling for juveniles, the adult fish must be released without further handling and such take must be reported.

8. The permit holder must exercise care during spawning ground surveys to avoid disturbing listed adult salmonids when they are spawning. Researchers must avoid walking in salmon streams whenever possible, especially where listed salmonids are likely to spawn. Visual observation must be used instead of intrusive sampling methods, especially when just determining presence of anadromous fish.

9. The permit holder using backpack electrofishing equipment must comply with NMFS' Backpack Electrofishing Guidelines (June 2000) available at http://www.nwr.noaa.gov/1salmon/salmesa/4ddocs/final4d/electro2000.pdf.

10. The permit holder must obtain approval from NMFS before changing sampling locations or research protocols.

11. The permit holder must notify NMFS as soon as possible but no later than 2 days after any authorized level of take is exceeded or if such an event is likely. The permit holder must submit a written report detailing why the authorized take level was exceeded or is likely to be exceeded.

12. The permit holder is responsible for any biological samples collected from listed species as long as they are used for research purposes. The permit holder may not transfer biological samples to anyone not listed in the application without prior written approval from NMFS.

13. The person(s) actually doing the research must have a copy of this permit while conducting the authorized activities.

14. The permit holder must allow any NMFS employee or representative to accompany field personnel while they conduct the research activities.

15. The permit holder must allow any NMFS employee or representative to inspect any records or facilities related to the permit activities.

16. The permit holder may not transfer or assign this permit to any other person as defined in Section 3(12) of the ESA. This permit ceases to be in effect if transferred or assigned to any other person without NMFS' authorization.

17. NMFS may amend the provisions of this permit after giving the permit holder reasonable notice of the amendment.

18. The permit holder must obtain all other Federal, state, and local permits/authorizations needed for the research activities.

19. On or before January 31 of every year, the permit holder must submit to NMFS a post-season report in the prescribed form describing the research activities, the number of listed fish taken and the location, the type of take, the number of fish intentionally killed and unintentionally killed, the take dates, and a brief summary of the research results. Falsifying annual reports or permit records is a violation of this permit.

20. If the permit holder violates any permit term or condition they will be subject to any and all penalties provided by the ESA. NMFS may revoke this permit if the authorized activities are not conducted in compliance with the permit and the requirements of the ESA or if NMFS determines that its ESA section 10(d) findings are no longer valid.

Finally, NMFS will monitor actual annual takes of ESA-listed fish species associated with scientific research activities, by requiring annual reports or by other means, and shall adjust annual permitted take levels if they are deemed to be excessive or if cumulative take levels are determined to operate to the disadvantage of the ESA-listed species.

The Proposed Individual Permits

The following information discusses the overall amounts of take being requested in each modification request, the general actions with which that take would be associated, and general location of research activities. "Take" is defined in section 3 of the ESA; it means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect or to attempt to engage in any such conduct. Detailed, action-by-action breakdowns (i.e., how much take is associated with each activity in each permit) are found in the Determination of Effects section.

Permit Modifications

Permit 1335 - USFS

The USFS in Corvalis, Oregon requests a modification to permit 1335 for annual take of juvenile threatened artificially propagated PS chinook salmon associated with its current study in the Puget Sound basin. The current permit allows take of naturally produced PS chinook salmon. The purposes of the research are to assess watershed conditions and factors limiting salmonid health and production, and evaluate watershed health under the Northwest Forest Plan. The activities will benefit listed fish by generating information to improve forest management. The USFS proposes to capture (using backpack electrofishing equipment), anesthetize, measure, and release up to 900 juvenile artificially propagated PS chinook salmon and unintentionally kill no more than 30 juvenile propagated PS chinook salmon.

Permit 1369-KCDNR

The KCDNRP in Seattle, Washington requests a modification to permit 1369 for increased annual take of juvenile threatened naturally produced PS chinook salmon associated with an expansion of work sites under its current study. The purpose of the study is to investigate scientific issues pertaining to how salmonid habitat in King County can be protected while concurrently providing local farmers with the technical and regulatory means to drain their farmlands to continue agricultural production. This program will develop a comprehensive information base about the habitat quality; the extent of the current and potential salmonid use of habitat where most commercial agriculture occurs; and techniques to avoid, minimize, or mitigate agriculture-related impacts on listed salmonids and their habitat. The KCDNRP proposes to capture (using fyke nets, minnow traps, and backpack electrofishing equipment); anesthetize; sample for biological data; and release up to 45 additional juvenile naturally produced PS chinook salmon and unintentionally kill no more than 5 additional juvenile naturally produced PS chinook salmon.

The Action Area

The action area for this consultation includes all marine, estuarine and river reaches accessible to listed chinook salmon in Puget Sound. Researchers will conduct their activities throughout this area. Accessible reaches are those within the historical range of the ESU that can still be occupied by any life stage of salmon or steelhead. Puget Sound marine areas include South Sound, Hood Canal, and North Sound to the international boundary at the outer extent of the Strait of Georgia, Haro Strait, and the Strait of Juan de Fuca to a straight line extending north from the west end of Freshwater Bay, inclusive. Also included are adjacent riparian zones. Excluded are tribal lands and areas above specific dams or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years). Major river basins containing spawning and rearing habitat for this ESU comprise approximately 13,761 square miles in Washington. The following counties lie partially or wholly within these basins (or contain migration habitat for the species): Clallam, Grays Harbor, Island, Jefferson, King, Kitsap, Lewis, Mason, Pierce, San Juan, Skagit, Snohomish, Thurston, and Whatcom.

STATUS OF THE SPECIES UNDER THE ENVIRONMENTAL BASELINE

To qualify for listing as a threatened species, PS chinook salmon must constitute "species" under the ESA. The ESA defines a "species" to include "any subspecies of fish, wildlife, or plants, and any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature." On November 20, 1991, NMFS published a policy (56 FR 58612) describing the agency's application of the ESA definition of "species" to Pacific salmonid species. This policy

provides that a Pacific salmonid population will be considered distinct, and hence a species under the ESA, if it represents an ESU of the biological species. The population must satisfy two criteria to be considered an ESU: (1) It must be reproductively isolated from other conspecific population units, and (2) it must represent an important component in the evolutionary legacy of the biological species. The first criterion, reproductive isolation, need not be absolute, but must be strong enough to permit evolutionarily important differences to accrue in different population units. The second criterion would be met if the population contributed substantially to the ecological/genetic diversity of the species as a whole. Further guidance on the application of this policy is contained in "Pacific salmon (*Oncorhynchus* spp.) and the Definition of Species under the ESA" (Waples, 1991) and a NOAA Technical Memorandum "Definition of 'Species' Under the Endangered Species Act: Application to Pacific Salmon" (NMFS/NWC-1994).

Status of PS Chinook Salmon

On March 24, 1999, NMFS listed PS chinook salmon, both naturally produced and artificially propagated fish, as a threatened species (64 FR 14308). The ESU encompasses all naturally spawned populations of chinook salmon from rivers and streams flowing into Puget Sound including the Straits of Juan De Fuca from the Elwha River, eastward, including rivers and streams flowing into Hood Canal, South Sound, North Sound and the Strait of Georgia in Washington. NMFS also listed chinook salmon (and their progeny) from the following hatchery stocks because they were considered essential to the recovery of the ESU: Kendall Creek (spring run); North Fork Stillaguamish River (summer run); White River (spring run); Dungeness River (spring run); and Elwha River (fall run).

The PS chinook salmon were listed as threatened under the ESA because NMFS determined that a number of factors—both environmental and demographic—had caused them to decline to the point where they were likely to be in danger of going extinct within the foreseeable future. These factors for decline affect their biological requirements at every stage of their lives and they arise from a number of different sources. This section of the Opinion explores those effects and defines the context within which they take place and provides information about their current status.

PS Chinook Salmon Life History

Chinook salmon in this ESU exhibit an "ocean type" life history (i.e., they emigrate to the ocean as subyearlings). While some spring- and summer-run populations in this ESU have a high proportion of yearling smolt emigrants, the proportion appears to fluctuate considerably from year to year. Populations in this ESU tend to mature at ages 3 and 4. Juvenile life stages (i.e., eggs, alevins, fry, and parr) inhabit freshwater/riverine areas throughout the range of the ESU.

Parr usually undergo a smolt transformation as subyearlings in the spring at which time they migrate to the ocean. Subadults and adults forage in coastal and offshore waters of the North Pacific Ocean prior to returning to spawn in their natal streams. Adult spring-run chinook salmon in this ESU typically return to fresh water in April and May and spawn in August and September. In contrast, summer-run chinook salmon return in June and spawn in September, while summer/fall-run fish begin to return in August and spawn from late September through January. Hatchery chinook salmon are also distributed within the range of this ESU, and as noted above under "Status of PS Chinook Salmon," several of these are listed under the ESA as part of the ESU.

Overview—Status of the PS Chinook Salmon

To determine a species' status under extant conditions (usually termed "the environmental baseline"), it is necessary to ascertain the degree to which the species' biological requirements are being met at the time of the proposed action and in that action area. For the purposes of this consultation, PS chinook salmon's biological requirements are expressed in two ways: population parameters such as fish numbers, distribution, and trends throughout the action area; and the condition of various essential habitat features such as water quality, substrate condition, and food availability. Clearly, these two types of information are interrelated; the condition of a given habitat has a great deal of impact on the number of fish it can support. Nonetheless, it is useful to separate the species' biological requirements into these parameters because doing so is a good way to get a full picture of all the factors affecting PS chinook and survival and their response to those factors. Therefore, the discussion to follow will be divided into two parts: (1) Species Distribution and Trends and (2) Factors Affecting the Environmental Baseline.

PS Chinook Salmon Distribution and Trends

NMFS has performed little formal modeling of extinction risk for the Puget Sound chinook ESU. However, the March 24, 1999 (64 FR 14308), listing determination and supporting species status reviews (NMFS, 1998a; NMFS, 1998b) provide relevant and recent information regarding the ESU's status. Based on the total Puget Sound catch in 1908 (when both ocean harvest and hatchery production were negligible), Bledsoe et al. (1989) estimated an historical abundance of 670,000 chinook salmon in this ESU. This estimate, as with other historical estimates, should be viewed cautiously. Puget Sound cannery pack probably included a portion of fish landed at Puget Sound ports but originating in adjacent areas, and cannery pack represents only a portion of the total catch.

Recent spawning escapement data for this ESU are summarized in Table 1 which addresses the WDFW and Tribal resource managers 15 chinook salmon "management units" (WDFW and PSIT, 2001) encompassing all listed chinook salmon populations in the Puget Sound ESU: (1)

Nooksack early, (2) Skagit spring, (3) Skagit summer/fall, (4) Stillaguamish summer/fall, (5) Snohomish, (6) Lake Washington summer/fall, (7) Green summer/fall, (8) White River, (9) Puyallup, (10) Nisqually, (11) Mid-Hood Canal, (12) Skokomish, (13) Dungeness, (14) Elwha, and (15) Western Strait. Throughout this document the reporting information—including maps—is organized by the watersheds defined by USGS Hydrologic Unit Code (HUC) (Figure 1) which encompass these "management units."

Escapement estimates compiled since 2000 (Bruce Sanford, WDFW. Pers. Comm. to C. Bill, Feb. 25, 2003) indicate that between 41,000 and 57,000 naturally produced chinook salmon have escaped to spawn in the range of the 15 management units (WDFW and PSIT, 2001). Though escapement trends have turned positive for many populations, 10 of these populations are influenced by hatchery production (WDFW and PSIT, 2001). Table 2 shows the known spawning aggregations of chinook salmon within the Puget Sound ESU by Geographic area. Nomenclature follows that described in the Salmon and Steelhead Stock Inventory (SASSI) document (WDF et al., 1993).

The distribution of negative and positive population trends is very uneven in Puget Sound. The positive trends are associated with populations having high hatchery influence, while negative trends are found in populations supported primarily by natural production. These data and others (e.g., declining recruit/spawner ratios in Skagit River populations) continue to raise serious concerns about the sustainability of natural chinook salmon populations in Puget Sound.

Factors Affecting the Environmental Baseline

Environmental baselines for biological opinions are defined by regulation at 50 CFR 402.02, which states that an environmental baseline is the physical result of all past and present state, Federal, and private activities in the action area along with the anticipated impacts of all proposed Federal projects in the action area (that have already undergone formal or early section 7 consultation). The environmental baseline for this biological opinion is therefore the result of the impacts that many activities (summarized below) have had on PS chinook salmon's survival and recovery. The baseline is the culmination of these effects on these species' biological requirements and, by examining those individual effects, it is possible to derive the species' status in the action area.

The biological requirements for PS chinook salmon in the action area can best be expressed in terms of the essential features of their habitat. That is, the salmon require adequate: (1) substrate (especially spawning gravel), (2) water quality, (3) water quantity, (4) water temperature, (5) water velocity, (6) cover/shelter, (7) food, (8) riparian vegetation, (9) space, and (10) migration conditions (65 FR 7764). The best scientific information presently available demonstrates that a multitude of factors, past and present, have contributed to the decline of west coast salmonids by adversely affecting these essential habitat features. NMFS reviewed much of

that information in its recently completed consultation (NMFS, 2002a). That review is summarized in the sections

Table 1. Spawning escapements (WDFW and PSIT, 2001) and juvenile outmigration estimates for Puget Sound natural chinook management units based on preliminary 2002 escapement estimates.

Geographic Area/ Management Unit	2000	2001	2002	Outmigration estimates (2003)*
Nooksack/Samish	**1525**	**2453**	**3969**	79,380
North Fork	1242	2185	3687	
South Fork	283	268	282	
Skagit	**17951**	**15649**	**20656**	4,131,200
Skagit spring	1021	1856	1065	
Skagit summer/fall	16930	13793	19591	
Stillaguamish	**1622**	**1349**	**1588**	31,760
Stillaguamish summer/fall	1622	1349	1588	
Snohomish	**6092**	**8164**	**7220**	1,444,000
Snohomish /skykomish	4665	4575	4325	
Snoqualmie	1427	3589	2895	
Lake Washington	**347**	**1269**	**637**	127,400
Cedar River	120	810	369	
North Lake Washington	227	459	268	
Green/Duwamish	**6170**	**7975**	**13950**	2,790,000
Green River fall	6170	7975	13950	
Puyallup	**2761**	**3915**	**2393**	478,600
White River spring	1523	2000	803	
Puyallup fall	1193	1915	1590	
Nisqually	**1253**	**1079**	**1542**	308,400
Nisqually fall	1253	1079	1542	
Hood Canal	**1281**	**2136**	**1574**	314,800
Mid Hood Canal	438	342	95	
Skokomish	843	1794	1479	
Dungeness/Elwha	**2787**	**3607**	**3725**	745,000
Dungeness	128	453	663	
Elwha River	1959	2208	2376	
Hoko	700	946	686	

*Outmigration estimates are based on the number of spawning female escapements and the

estimated survival rate from egg to smolt. Further information is provided on page 14 of NMFS (2003).

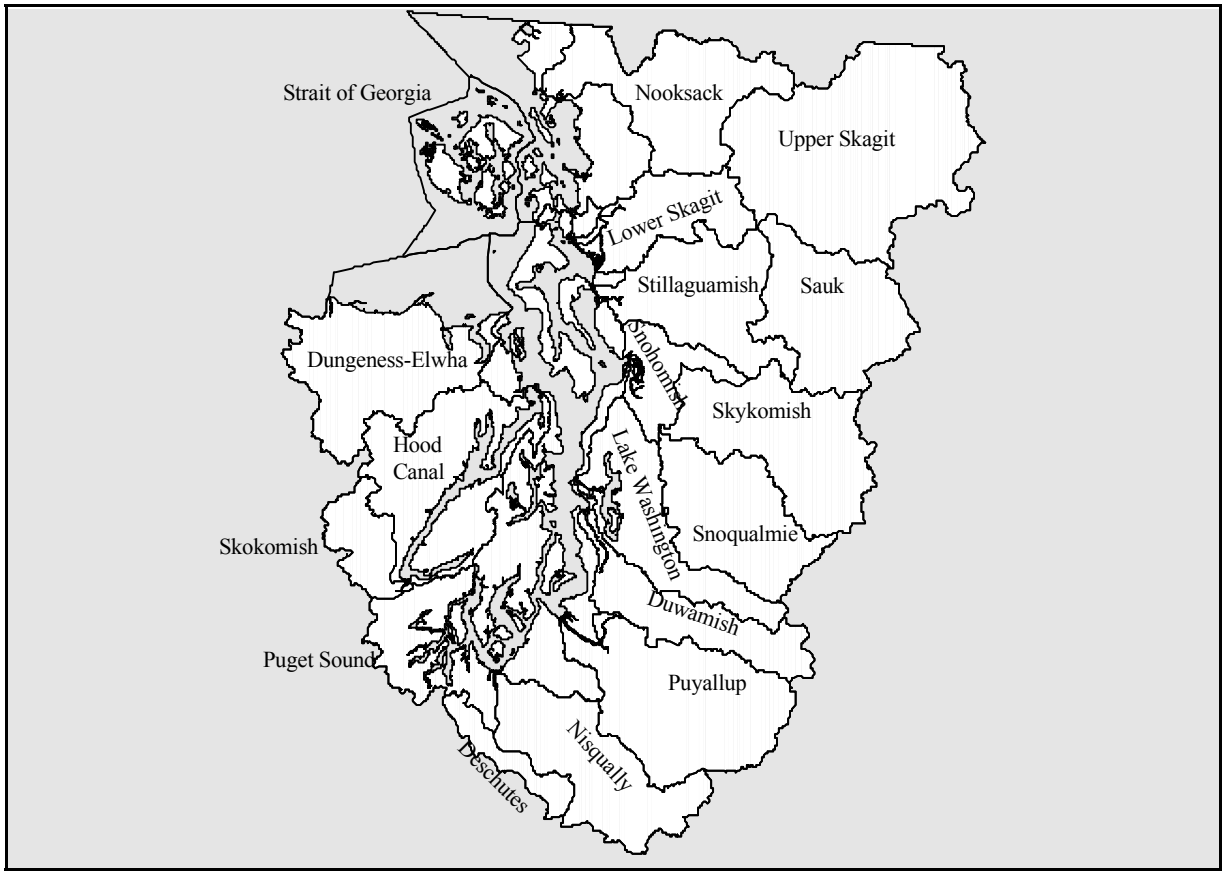

Figure 1. Watershed basins and drainages defined by USGS Hydrologic Unit Code (HUC).

Table 2. Known spawning aggregations of chinook salmon within the Puget Sound ESU by Geographic area.

Geographic Area	SASSI stock	Spawning aggregation
Nooksack/Samish	North Fork Nooksack	mainstem
		lower middle Fork Nooksack River
		Maple Creek
		Canyon Creek
		Cornell Creek
		Boyd Creek
		McDonald Creek
	Samish/Mainstem Nooksack fall	mainstem Nooksack River
		Samish
Skagit	Upper Skagit mainstem/tribs summer	mainstem
		llabot Creek
		Bacon Creek
		Falls Creek
		Goodell Creek
		Clark Creek
		Diobsud Creek
	Lower Skagit mainstem/tribs fall	mainstem
	Lower Sauk summer	mainstem
	Upper Sauk spring	mainstem
		White Chuck River
		South Fork Sauk River
	Suiattle spring	Mainstem
		Sulphur Creek
		Buck Creek
		Big Creek
		Lime Creek
	Upper Cascade spring	mainstem
Stillaguamish	Stillaguamish summer	North Fork Stillaguamish River
		Boulder River
	Stillaguamish fall	South Fork Stillaguamish River
		mainstem Stillaguamish River
		Jim Creek
		Canyon Creek
Snohomish	Snohomish summer	mainstem Snohomish
		mainstem Skykomish
	Wallace summer/fall	mainstem
	Snohomish fall	Snoqualmie River
		Sultan River
		Pilchuck River
		Woods Creek
		Elwell Creek
		Tolt River
	Bridal Veil Creek fall	Bridal Veil Creek
		South Fork Skykomish River
		North Fork Skykomish River
Lake Washington	Issaquah	Issaquah Creek
		East Fork Issaquah Creek
	North Lake Washington tribs	North Creek

Table 2. (Continued).

Geographic Area	SASSI stock	Spawning aggregation
		Swamp Creek
		Bear Creek
		Little Bear Creek
		Thornton Creek
		McAleer Creek
		Cottage Lake Creek
		Sammamish River
	Cedar summer/fall	mainstem
Duwamish/Green	Duwamish/Green summer fall	Duwamish River
		Green River
		Newaukum Creek
Puyallup	White (Puyallup) spring	mainstem
		Clearwater River
		Greenwater River
		West Fork White River
	White (Puyallup) summer/fall	Mainstem
	Puyallup fall	mainstem
		South Prairie Creek
		Carbon River
Nisqually	Nisqually summer/fall	Mainstem
		Ohop Creek
		Mashel River
South Sound	South Sound tributaries summer/fall	McAllister Creek
		Grovers Creek
		Gorst Creek
		Chambers Creek
		Carr Inlet streams
		Deschutes River
Hood Canal	Hood Canal	Skokomish River
		Hamma Hamma River
		Dosewallips River
		Duckabush River
		Union River
		Tahuya River
		Dewatto River
Strait of Juan de Fuca	Dungeness spring/summer	mainstem
		Gray Wolf River
	Elwha/Morse Creek summer/fall	Elwha River
		Morse Creek

below.

Human-Induced Habitat Degradation

Bishop and Morgan (1996) identified a variety of habitat issues for streams in the range of this ESU because of urbanization, forest and agricultural practices including (1) changes in flow regime (all basins), (2) sedimentation (all basins), (3) high temperatures (Dungeness, Elwha, Green/Duwamish, Skagit, Snohomish, and Stillaguamish Rivers), (4) streambed instability (most basins), (5) estuarine loss (most basins), (6) loss of large woody debris (Elwha, Snohomish, and White Rivers), (7) loss of pool habitat (Nooksack, Snohomish, and Stillaguamish Rivers), and (8) blockage or passage problems associated with dams or other structures (Cedar, Elwha, Green/Duwamish, Snohomish, and White Rivers). Further, aquaculture practices have played a role in degrading riverine and estuarine habitats. These activities and the resulting habitat modifications have greatly degraded extensive areas of salmon spawning and rearing habitat in the Puget Sound. The rising population density in parts of Washington will also continue to adversely affect the quality and quantity of local water resources for chinook salmon.

To counteract all the negative effects listed in this section, Federal, state, tribal, and private entities have—singly and in partnership—begun recovery efforts to help slow and, eventually, reverse the decline of salmon and steelhead populations. Notable efforts within the range of PS chinook are the Wild Stock Restoration Initiative, Joint Wild Salmonid Policy, Shorelines Management Act, and the Northwest Forest Plan. Nevertheless, despite these efforts, much remains to be done to recover these species and other salmonids in the Puget Sound Basin.

Hatcheries

Fall-, summer-, and spring-run chinook salmon stocks are artificially propagated in Puget Sound. Currently, the majority of production is devoted to fall-run (also called summer/fall) stocks for the purpose of enhancing fisheries. Conversely, approximately half of the depressed spring- and summer-run stocks recognized by WDF et al. (1993) are under captive culture or supplementation programs. Captive broodstock/recovery programs for spring-run chinook salmon have been undertaken on the White River (Appleby and Keown, 1994) and the Dungeness River (Smith and Sele, 1995). Supplementation programs currently exist for spring-run chinook salmon on North Fork Nooksack River and for summer-run chinook salmon on the Stillaguamish and Skagit Rivers (Fuss and Ashbrook, 1995; Marshall et al., 1995).

Hatchery fish can harm naturally produced salmon and steelhead in four primary ways: (1) ecological effects, (2) genetic effects, (3) overharvest effects, and (4) masking effects (NMFS, 2000c). Ecologically, hatchery fish can prey upon, displace, and compete with wild fish. These effects are most likely to occur when fish are released in poor condition and do not migrate to marine waters, but rather remain in the streams for extended rearing periods. Hatchery fish also

may transmit hatchery-borne diseases, and hatcheries themselves may release disease-carrying effluent into streams. Hatchery fish can affect the genetic composition of native fish by interbreeding with them. Interbreeding can also be caused by humans taking native fish from one area and using them in a hatchery program in another area. Interbred fish are less adapted to the local habitats where the original native stock evolved and may therefore be less productive there.
To address concerns of potential disease transmission from hatchery salmonids and to minimize water quality impacts, comanagers developed a Fish Health Policy and are in compliance with the National Pollutant Discharge Elimination System permit provisions and Pacific Northwest Fish Health Protection Committee's comprehensive fish health protection program.

Harvest

Fisheries in Puget Sound have sometimes been managed poorly because "maximum sustainable yield" rates have been identified incorrectly in light of declining productivity of natural chinook salmon stocks. High harvest rates directed at hatchery stocks have caused many stocks to fail to meet natural escapement goals in most years (USFWS, 1996). Harvest impacts on Puget Sound chinook salmon stocks have been quite high. Salmon are also taken incidentally in the groundfish and whiting fishery off Washington, Oregon, and California (NMFS, 1996).

Co-managers implemented several strategies to manage the recreational harvest. Time/area closures are used to reduce catches of weak stocks in directed fisheries and to reduce chinook bycatch in other fisheries. Other regulations, such as size limits, bag limits, and barbless hooks are also used. Most recently, managers have begun using mass marking and selective fishing practices to protect natural stocks.

Natural Conditions

Recent declines in fish populations in Puget Sound may reflect increased predation and recent climatic shifts. NMFS has noted that predation by marine mammals has increased as marine mammal numbers, especially harbor seals (*Phoca vitulina*) and California sea lions (*Zalophus californianus*) increase on the Pacific Coast (NMFS, 1988). In addition to predation by marine mammals, Fresh (1997) reported that 33 fish species and 13 bird species are predators of juvenile and adult salmon, particularly during freshwater rearing and migration stages.

Changes in climate and ocean conditions happen on several different time scales and have had profound influence on distributions and abundances of marine and anadromous fishes. Recent evidence suggests that marine survival among salmonids fluctuates in response to 20- to 30-year cycles of climatic conditions and ocean productivity (Hare et al., 1999). Although recent climatic conditions appear to be within the range of historical conditions, the risks associated

with climatic changes are probably exacerbated by human activities (Lawson, 1993).

Scientific Research

PS chinook salmon, like other ESA-listed fish, are the subject of scientific research and monitoring activities. Most biological opinions issued by NMFS have conditions requiring specific monitoring, evaluation, and research projects to gather information to aid the survival of listed fish. NMFS issued numerous research permits/approvals allowing takes of PS chinook (NMFS, 2002a, 2002b, 2002c, 2002d, 2003). The take currently authorized annually by the section 10 research permits and 4(d) research approvals analyzed in these consultations is summarized in the following table.

Table 3. Total Authorized Annual Take of Threatened PS Chinook Salmon.

	PS Chinook Salmon			
	Adult		Juvenile	
	Non-lethal	Lethal	Non-Lethal	Lethal
Section 10 Research	66	0	129,264	2,890
4(d) Research	1,100	10	377,264	4,179
Total	1,166	10	506,528	7,069

Each authorization for take by itself would not lead to decline of the species. However the sum of the authorized takes indicate a high level of research effort in the action area. Although the effect of these activities have negative effects on the ESU because fish are harassed and even killed in the course of scientific research, the information gained from research has a great potential to benefit ESA-listed species. For example, research: (1) increases what is known about the listed species and their biological requirements, (2) answers key questions associated with difficult resource issues that crop up in every management arena and involve every salmonid life history stage (particularly the resource issues discussed in the previous section), and (3) helps resource managers plan for the recovery of listed species.

In any case, scientific research and monitoring efforts (unlike the other factors described in the previous sections) are not considered to be a factor contributing to the decline of PS chinook salmon, and NMFS believes that the information derived from the research activities is essential to their survival and recovery. Nonetheless, fish are harmed during research activities and therefore, to minimize any harm arising from such activities, NMFS imposes conditions in its

permits so that permit holders reduce adverse effects including keeping mortalities as low as possible. Researchers are encouraged to use non-listed fish species and hatchery fish instead of listed naturally produced fish when possible. Also, researchers are required to share sampled fish, as well as the results of the scientific research, with other researchers and comanagers in the region as a way to avoid duplicative research efforts and to acquire as much information as possible from the ESA-listed fish sampled. NMFS also works with other agencies to coordinate research and thereby prevent duplication of effort.

For projects that require an ESA section 10(a)(1)(A) permit, applicants provide NMFS with high take estimates to compensate for potential in-season changes in research protocols, accidental catastrophic events, and the annual variability in listed fish numbers. Also, most research projects depend on annual funding and the availability of other resources. So, a specific research project for which take of ESA-listed species is authorized by a permit may be suspended in a year when funding or resources are not available. As a result, the *actual* take in a given year for most research projects, as provided to NMFS in post-season annual reports, is usually less than the authorized level of take in the permits and the related NMFS consultation on the issuance of those permits. Therefore, because actual take levels tend to be lower than authorized takes, the severity of effects to the ESA-listed species resulting from the conduct of scientific research activities are usually less than the effects analyzed in a typical research permit consultation.

Summary

The picture of whether PS chinook salmon's biological requirements are being met is clear-cut for habitat-related parameters and for population factors; given all the factors for decline—even taking into account the corrective measures being implemented[2]—it is clear that their biological requirements are currently not being met under the environmental baseline. Their status is such that there must be a significant improvement in the environmental conditions of the species' respective habitats (over those currently available under the environmental baselines). Any further degradation of the environmental conditions would have a significant impact due to the amount of risk the species presently face under the environmental baselines. In addition, there must be considerable improvements to minimize effects due to hydropower dams, incidental and direct harvest, hatchery practices, and unfavorable estuarine and marine conditions.

[2] See the following documents for a summary of conservation efforts: Steelhead Conservation Efforts: A Supplement to the Notice of Determination for West Coast Steelhead Under the Endangered Species Act, August 1996; Coastal Salmon Conservation Working Guidance for Comprehensive Salmon Restoration Initiatives on the Pacific Coast, September 15, 1996; NOAA Technical Memorandum NMFS-NWFSC-42, June 2000, Viable Salmon Populations and the Recovery of Evolutionarily Significant Units.

EFFECTS OF THE ACTION

The purpose of this section is to identify the effects NMFS' issuance of scientific research permits will have on threatened PS chinook salmon. To the extent possible, this will include analyses of effects at the population level. Where information on PS chinook salmon is scarce at the population level (or naturally spawning populations are not presently assigned to an independent population), this analysis assumes that the status of each affected population is the same as the ESU as a whole. Analyses of effects also include hatchery stocks NMFS considers essential to the ESU's recovery. NMFS concluded that five of the hatchery chinook salmon stocks identified as part of the PS chinook salmon ESU should be listed since they are currently essential for its recovery (NMFS, 1999d). The listed hatchery stocks are: Kendall Creek (spring run); North Fork Stillaguamish River (summer run); White River (spring run); Dungeness river (spring run); and Elwha River (fall run). Table 4 summarizes the 2003 hatchery production goals by listed hatchery stocks.

Table 4. Listed hatchery stocks. Production goals for 2003.

Brood Stock	**Production Goal***	
	Subyearling	Yearlings
Kendall Creek (spring-run)	5.8 million	100,000
North Fork Stillaguamish River (summer-run)	200,000	N/A
White River (spring-run)	1.35 million	175,000
Dungeness river (spring-run)	2.0 million	N/A
Elwha River (fall-run)	3.85 million	N/A

*Bruce Sanford, NMFS. Pers. Comm. to C. Bill, February 25, 2003.

Evaluating the Effects of the Action

Over the course of several years and numerous ESA section 7 consultations, NMFS developed the following four-step approach for using the ESA Section 7(a)(2) standards to determine what effect a proposed action is likely to have on a given listed species. What follows here is a summary of that approach.

1. Define the biological requirements and current status of each listed species.

2. Evaluate the relevance of the environmental baseline to the species' current status.

3. Determine the effects of the proposed or continuing action on listed species and their habitat.

4. Determine whether the species can be expected to survive with an adequate potential for recovery under (a) the effects of the proposed (or continuing) action, (b) the effects of the environmental baseline, and (c) any cumulative effects—including all measures being taken to improve salmonid survival and recovery.

The fourth step above requires a two-part analysis. The first part focuses on the action area and defines the proposed action's effects in terms of the species' biological requirements in that area (i.e., impacts on essential habitat features). The second part focuses on the species itself. It describes the action's impact on individual fish—or populations, or both—and places that impact in the context of the ESU as a whole. Ultimately, the analysis seeks to answer the questions of whether the proposed action is likely to jeopardize a listed species' continued existence or destroy or adversely modify its designated critical habitat.

Critical habitat was designated for PS chinook salmon on February 16, 2000, when NMFS published a final rule in the Federal Register (65 FR 7764). However, the critical habitat designation for PS chinook salmon was vacated and remanded to NMFS for new rulemaking pursuant to a court order in April 2002. In the absence of a new rule designating critical habitat for PS chinook salmon, this consultation will include an evaluation of the effects of the proposed actions on the species' habitat to determine whether those actions are likely to jeopardize the continued existence of the species.

Effects on PS Chinook Salmon Habitat

Previous sections have described the scope of the habitat in the action area and the range of the ESU, the essential features of PS chinook habitat, and depicted its present condition. The discussion here focuses on how those features are likely to be affected by the proposed actions.

Full descriptions of the proposed activities are found in the next section. In general, the activities will be (a) electrofishing using backpack and boat equipment, (b) streamside and snorkel surveys in spawning and rearing habitat, and (c) capturing fish with traps and nets of various types. All of these techniques are minimally intrusive in terms of their effect on habitat. None of them will measurably affect any of the 10 essential fish habitat features listed earlier (i.e., stream substrates, water quality, water quantity, food, streamside vegetation, etc.). Moreover, the proposed activities are of short duration. Therefore, NMFS concludes that the proposed activities are unlikely to adversely modify or destroy PS chinook salmon habitat.

Effects on PS Chinook Salmon

The primary effects the proposed activities will have on PS chinook salmon will be in the form of intentional "take" (the ESA take definition is given in the section introducing the individual permits) usually in the form of capture and handling the fish. The following section discusses general effects known to be caused by the proposed activities, regardless of where they occur or what species are involved.

Capture/handling

Capturing and handling fish causes them stress—though they typically recover fairly rapidly from the process and therefore the overall effects of the procedure are generally short-lived. The primary contributing factors to stress and death from handling are excessive doses of anesthetic, differences in water temperatures (between the river and wherever the fish are held), dissolved oxygen conditions, the amount of time that fish are held out of the water, and physical trauma. Stress on salmonids increases rapidly from handling if the water temperature exceeds 18°C or dissolved oxygen is below saturation. Fish that are transferred to holding tanks can experience trauma if care is not taken in the transfer process, and fish can experience stress and injury from overcrowding in traps if the traps are not emptied on a regular basis. Debris buildup at traps can also kill or injure fish if the traps are not monitored and cleared on a regular basis. To minimize these effects NMFS requires the measured described on pages 2-4 to be taken. Those measures are the permit conditions.

Based on prior experience with the research techniques and protocols that would be used to conduct the proposed scientific research, no more than five percent of the juvenile salmonids encountered are likely to be killed as an unintentional result of being captured and handled and, in most cases, that figure will not exceed three percent. In addition, it is not expected that more than one percent of the adults being handled will die and in any case, all researchers will follow the mitigation measures described earlier thereby keeping adverse effects to a minimum. Finally, any fish unintentionally killed by the research activities in the proposed permits may be retained as reference specimens or used for other research purposes.

Electrofishing

Electrofishing is a process by which an electrical current is passed through water containing fish in order to stun them—thus making them easy to capture. It can cause a suite of effects ranging from simple harassment to actually killing the fish. The amount of unintentional mortality attributable to electrofishing may vary widely depending on the equipment used, the settings on the equipment, and the expertise of the technician. Electrofishing can have severe effects on adult salmonids. Spinal injuries in adult salmonids from forced muscle contraction have been

documented. Sharber and Carothers (1988) reported that electrofishing killed 50 percent of the adult rainbow trout in their study. The long-term effects electrofishing has on both juveniles and adult salmonids are not well understood, but long experience with electrofishing indicates that most impacts occur at the time of sampling and are of relatively short duration.

The effects of electrofishing on PS chinook would be limited to the direct and indirect effects of exposure to an electric field, capture by netting, holding captured fish in aerated tanks, and the effects of handling associated with transferring the fish back to the river (see the next subsection for more detail on capturing and handling effects). Most of the studies on the effects of electrofishing on fish have been conducted on adult fish greater than 300 mm in length (Dalbey et al., 1996). The relatively few studies that have been conducted on juvenile salmonids indicate that spinal injury rates are substantially lower than they are for large fish. Smaller fish intercept a smaller head-to-tail potential than larger fish (Sharber and Carothers, 1988) and may therefore be subject to lower injury rates (e.g., Hollender and Carline, 1994; Dalbey et al., 1996; Thompson et al., 1997). McMichael et al. (1998) found a 5.1% injury rate for juvenile MCR steelhead captured by electrofishing in the Yakima River subbasin. The incidence and severity of electrofishing damage is partly related to the type of equipment used and the waveform produced (Sharber and Carothers, 1988; McMichael, 1993; Dalbey et al., 1996; Dwyer and White, 1997). Continuous direct current (DC) or low-frequency ($\leq$30 Hz) pulsed DC have been recommended for electrofishing (Fredenberg, 1992; Snyder, 1992, 1995; Dalbey et al. 1996) because lower spinal injury rates, particularly in salmonids, occur with these waveforms (Fredenberg, 1992; McMichael, 1993; Sharber et al., 1994; Dalbey et al., 1996). Only a few recent studies have examined the long-term effects of electrofishing on salmonid survival and growth (Dalbey et al., 1996; Ainslie et al., 1998). These studies indicate that although some of the fish suffer spinal injury, few die as a result. However, severely injured fish grow at slower rates and sometimes they show no growth at all (Dalbey et al., 1996).

NMFS' electrofishing guidelines (NMFS, 2000c) will be followed in all surveys using this procedure. The guidelines require that field crews be trained in observing animals for signs of stress and shown how to adjust electrofishing equipment to minimize that stress. Electrofishing is used only when other survey methods are not feasible. All areas for stream and special needs surveys are visually searched for fish before electrofishing may begin. Electrofishing is not done in the vicinity of redds or spawning adults. All electrofishing equipment operators are trained by qualified personnel to be familiar with equipment handling, settings, maintenance, and safety. Operators work in pairs to increase both the number of fish that may be seen and the ability to identify individual fish without having to net them. Working in pairs also allows the researcher to net fish before they are subjected to higher electrical fields. Only DC units will be used, and the equipment will be regularly maintained to ensure proper operating condition. Voltage, pulse width, and rate will be kept at minimal levels and water conductivity will be tested at the start of every electrofishing session so those minimal levels can be determined. Due to the low settings used, shocked fish normally revive instantaneously. Fish requiring revivification will receive immediate, adequate care.

The preceding discussion focused on the effects of using a backpack unit for electrofishing and the ways those effects will be mitigated. It should be noted, however, that in larger streams and rivers electrofishing units are sometimes mounted on boats. These units often use more current than backpack electrofishing equipment because they need to cover larger (and deeper) areas and, as a result, can have a greater impact on fish. In addition, the environmental conditions in larger, more turbid streams can limit researchers' ability to minimize impacts on fish. For example, in areas of lower visibility it is difficult for researchers to detect the presence of adults and thereby take steps to avoid them. Because of its greater potential to harm fish, and because NMFS has not published appropriate guidelines, boat electrofishing has not been given a general authorization under NMFS' recent ESA section 4(d) rules. However, it is expected that guidelines for safe boat electrofishing will be in place in the near future. And in any case, all researchers intending to use boat electrofishing will use all means at their disposal to ensure that a minimum number of fish are harmed (these means will include a number of long-established protocols that will eventually be incorporated int NMFS' guidelines).

Benefits of Research

Under section 10(d) of the ESA, NMFS is prohibited from issuing a section 10(a)(1)(A) permit unless NMFS finds that the permit (1) was applied for in good faith; (2) if granted and exercised, will not operate to the disadvantage of the endangered and/or threatened species that is/are the subject of the permit; and (3) is consistent with the purposes and policy of section 2 of the ESA. In addition, NMFS does not issue a section 10(a)(1)(A) permit unless the proposed activities are likely to result in a net benefit to the ESA-listed species that is/are the subject of the permit; benefits accrue from the acquisition of scientific information.

For more than a decade, research and monitoring activities conducted with anadromous salmonids in the Pacific Northwest have provided resource managers with a wealth of important and useful information on anadromous fish populations. For example, juvenile fish trapping efforts have enabled the production of population inventories, PIT-tagging efforts have increased the knowledge of anadromous fish migration timing and survival, and fish passage studies have provided an enhanced understanding of fish behavior and survival when moving past dams and through reservoirs. By issuing section 10(a)(1)(A) scientific research permits, NMFS will cause information to be acquired that will enhance the ability of resource managers to make more effective and responsible decisions to sustain anadromous salmonid populations that are at risk of extinction, to mitigate impacts to endangered and threatened chinook salmon and steelhead, and to implement recovery efforts. The resulting data will improve the knowledge of the respective species' life history, specific biological requirements, genetic make-up, migration timing, responses to anthropogenic impacts, and survival in the river system.

Permit-specific Effects

In addition to the effects discussed above, each permits's proposed activities may have additional adverse effects that need to be analyzed. Researchers will use measures required through the permit conditions discussed previously to mitigate such adverse impacts on listed ESUs.

In the "Status of the Species" section both juvenile and adult population abundance is discussed. In the following section NMFS analyzes the impacts of the take numbers in the context of those numbers.

Permit 1335

Permit 1335 currently authorizes the USFS to capture, handle and release up to 900 juvenile naturally produced PS chinook salmon and with an unintentional mortality of 30 juvenile naturally produced PS chinook salmon. The modification to permit 1335 would also authorize the USFS to capture, handle, and release up to 900 juvenile artificially propagated PS chinook and with unintentional mortality of no more than 30 juvenile artificially propagated PS chinook salmon in addition to their current take. Sampling activities will occur in the Puget Sound nearshore environments.

NMFS estimates a production of 13 million juvenile artificially propagated PS chinook salmon (Table 4). If juvenile PS chinook salmon production is typical for future years in Puget Sound, the annual loss of up to 30 juvenile artificially propagated PS chinook salmon associated with the USFS's research will not have a measurable impact on either the juvenile population nor on the status of the ESU.

Permit 1369

Permit 1369 currently authorizes the KCDNRP to capture, handle, anesthetize, and release up to eight juvenile naturally produced PS chinook salmon, capture, handle and release one adult PS chinook salmon and unintentionally kill no more than two juvenile naturally produced PS chinook salmon as an indirect result of being captured. The modification to permit 1369 would authorize the KCDNRP to capture, handle, anesthetize, and release up to an additional 37 juvenile naturally produced PS chinook salmon and unintentionally kill no more than an additional three juvenile naturally produced PS chinook salmon. Sampling activities resulting in PS chinook salmon take will occur in several stream segments in the Snohomish, Lake Washington, Green-Duwamish, and Puyallup basins.

Since these projects will occur in several Puget Sound subbasins it is not possible to determine the effects on a single breeding population in this ESU. However, NMFS roughly estimates 4.8 million juvenile, naturally produced PS chinook salmon will outmigrate to the Puget Sound from the basins mentioned above (Table 1). If this outmigration is typical for future years, the annual

loss of up to three juvenile, naturally produced PS chinook salmon associated with the KCDNR's research (indirect mortalities due to handling) will not have a measurable impact on the status of the PS chinook salmon ESU.

Cumulative Effects

Cumulative effects include the effects of future state, tribal, local or private actions (not involving Federal activities) that are reasonably certain to occur within the action area of this consultation. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to Section 7 of the Act.

State, tribal and local government actions will likely be in the form of legislation, administrative rules or policy initiatives. Government and private actions may include changes in land and water uses, including ownership and intensity, any of which could impact listed species or their habitat. Government actions are subject to political, legislative and fiscal uncertainties. These realities, added to geographic scope of the action area which encompasses numerous government entities exercising various authorities and the many private landholdings, make any analysis of cumulative effects difficult and frankly speculative. This section identifies representative actions that, based on currently available information, are reasonably certain to occur. It also identifies some goals, objectives and proposed plans by government entities.

Representative State Actions

The Washington state government is cooperating with other governments to increase environmental protection for listed ESUs, including better habitat restoration, hatchery and harvest reforms, and water resource management. The following list of organizations and initiatives—described in the Summer Chum Salmon Conservation Initiative (WDFW/PNPT, 2000) and Steelhead Conservation Efforts (NMFS, 1996)—are directed at or contributing to the recovery of PS chinook salmon:

- Washington Wildlife and Recreation Program
- Wild Stock Restoration Initiative
- Joint Wild Salmonid Policy
- 1994 - Hood Canal Coordinating Council
- Governor's Salmon Recovery Office
- Conservation Commission
- Salmon Recovery Lead Entities' Program
- Salmon Recovery Funding Board Program
- Forest and Fish Report
- Growth Management Act Programs

There are other proposals, rules, policies, initiatives, and government processes that help conserve marine resources in Washington, improve the habitat of listed species, and assist in recovery planning that are too numerous to mention. As with the above state initiatives, these programs could benefit the listed species if implemented and sustained.

In the past, Washington state's economy was heavily dependent on natural resources, with intense resource extraction activity. Changes have occurred in the last decade and are likely to continue with less large scale resource extraction, more targeted extraction methods, and significant growth in other economic sectors. Continued impacts affecting habitat features, such as water quality and quantity, which are important to the survival and recovery of the listed species need to be carefully planned for and mitigated through the initiatives and measures described above.

Local Actions

Local governments will be faced with similar but more direct pressures from population pressures. There will be demands for intensified development in rural areas as well as increased demands for water, municipal infrastructure and other resources. The reaction of local governments to such pressures is difficult to assess at this time without certainty in policy and funding. In the past local governments in the action area generally accommodated additional growth in ways that adversely affected listed fish habitat allowing for development to destroy wetlands, habitat, etc.

Some local government programs, if submitted, may qualify for a limit under the NMFS' ESA section July 10, 2000, 4(d) rule (50 CFR 223.203) which is designed to conserve listed species. Local governments also may participate in regional watershed health programs, although political will and funding will determine participation and therefore the effect of such actions on listed species. Overall, without comprehensive and cohesive beneficial programs and the sustained application of such programs, it is likely that local actions will have few measurable positive effects on listed species and their habitat, and may even contribute to further degradation.

Tribal Actions

Tribal governments participate in cooperative efforts involving watershed and basin planning designed to improve fish habitat and are expected to continue to do so. In addition, tribal governments manage hatchery and harvest programs that affect listed salmon. The results from changes in tribal forest and agriculture practices, in water resource allocations, and in changes to land uses are difficult to assess for the same reasons discussed under State and Local Actions.

The earlier discussions related to growth impacts apply also to tribal government actions. Tribal governments will need to apply comprehensive and beneficial natural resource programs to areas under their jurisdiction to produce measurable positive effects for listed species and their habitat.

Private Actions

The effects of private actions are the most uncertain. Private landowners may convert current use of their lands, or they may intensify or diminish current uses. Individual landowners may voluntarily initiate actions to improve environmental conditions, or they may abandon or resist any improvement efforts. Their actions may be compelled by new laws, or may result from growth and economic pressures. Changes in ownership patterns will have unknown impacts.

Summary

Non-federal actions on listed species are likely to continue affecting listed species. The cumulative effects in the action area are difficult to analyze considering the geographic landscape of this Opinion, the uncertainties associated with government and private actions, and the changing economies of the region. Whether these effects will increase or decrease is a matter of speculation; however, based on the trends identified in this section, the adverse cumulative effects are likely to increase. State, tribal and local governments have developed plans and initiatives to benefit listed fish but they must be applied and sustained in a comprehensive way.

Integration and Synthesis of Effects

The vast majority (more than 95%) of the juvenile and adult PS chinook salmon that will be "taken" during the course of the proposed and currently authorized research (a total of 514,567 juvenile and 1,166 adult fish) are expected to survive with no long-term effects. Moreover, most capture, handling, and holding methods will be minimally intrusive and of short duration. Since adult PS chinook salmon are not analyzed in this consultation, and the current authorized take for adult PS chinook salmon has been analyzed in previous consultations, this consultation will only analyze the effects on the juvenile salmon in this ESU.

Because so many of the captured juveniles are expected to survive the research actions and so few (a maximum of 2% of the total juvenile PS chinook salmon outmigration) will be affected in even the slightest way, it is likely that no adverse effects will result from these actions at either the population or the ESU level. Therefore, adverse effects must be expressed in terms of the individual fish that may be killed during the various permitted activities. The following table summarizes the (1) annual take analyzed in this consultation for each permit action, (2) current annual take authorized under section 10 and 4(d) research, and (3) total annual take that would

be authorized.

Table 3. Maximum Annual Takes of Threatened Puget Sound Chinook Salmon.

	Adult		Juvenile	
Permit Action	Non-lethal	Lethal	Non-lethal	Lethal
1335 modification 3	0	0	900	30
1369 modification 1	0	0	37	3
Section 10 and 4(d) Research Current Authorized Annual Take	1,166	10	506,528	7,069
Total	1,166	10	507,465	7,102

If the total amount of estimated annual lethal take for all research activities—7,102 juvenile PS chinook salmon—is expressed as a fraction of the 23.4 million fish expected to reach Puget Sound each year, it represents a loss of 0.03% of the run. However, and for a number of reasons, that number is probably much smaller. First, as stated earlier in the Opinion, the anticipated outmigration of PS chinook salmon is some number larger than the 10.4 million fish and the ESA-listed hatchery fish released exceed 13 million fish. It is impossible to say how much bigger that number would be if we had figures for all of the spawning populations in the Puget Sound Basin, but it is certain that using the 23.4 million figure to represent the entire PS chinook salmon outmigration is a very conservative estimate. Second, it is important to remember to account for potential accidental deaths, that every estimate of lethal take for the proposed studies has purposefully been inflated and it is therefore very likely that fewer than 7,102 juveniles will be killed by the research—possibly fewer. Third, some of the studies will specifically affect PS chinook salmon in the smolt stage, but others will not. These latter studies are described as affecting "juveniles," which means they may target PS chinook salmon yearlings, parr, or even fry: life stages represented by many more individuals than reach the smolt stage—perhaps as much as an order of magnitude more. Therefore the 0.03% figure was derived by (a) underestimating the actual number of outmigrating PS chinook salmon smolts, (b) overestimating the number of fish likely to be killed, and c) treating each dead PS chinook salmon as a smolt when some of them clearly won't be. Thus the actual number of PS chinook salmon the research is likely to kill is undoubtedly smaller than 0.03%—perhaps as little as half (or less) of that figure.

But even if the entire 0.03% of the juvenile PS chinook salmon population were killed annually, and they were all treated as smolts, it would be very difficult to translate that number into an actual effect on the species. Even if the subject were one adult killed out of a population of one

thousand it would be hard to resolve an adverse effect. And in this instance, that effect is even smaller because the loss of a smolt is not equivalent to the loss of an adult in terms of species survival and recovery. This is due to the fact that a great many smolts die before they can mature into adults. Nonetheless, regardless of its magnitude, that negative effect must be juxtaposed with the benefits to be derived from the research (see descriptions of the individual permits). In all, the fish will derive some benefit from every permit currently authorized and those considered in this Opinion. The amount of benefit will vary, but in some cases it may be significant. For the purpose of section 7(a)(2) NMFS must consider the adverse effects when deciding whether the contemplated actions will appreciably reduce the likelihood of the PS chinook salmon's survival and recovery in the wild—the critical determination in issuing any biological opinion.

CONCLUSIONS

After reviewing the current status of threatened PS chinook salmon, the environmental baseline for the action area, the effects of the proposed section 10(a)(1)(A) permit actions, and cumulative effects, it is NMFS' biological opinion that issuance of the proposed permits, and the funding of the proposed activities by Federal agencies, are not likely to jeopardize the continued existence of threatened PS chinook, nor destroy or adversely modify their habitat.

Coordination with the National Ocean Service

The activities contemplated in this Biological Opinion will not be conducted in or near a National Marine Sanctuary. Therefore, these activities will not have an adverse effect on any National Marine Sanctuary.

Reinitiation of Consultation

Consultation must be reinitiated if: The amount or extent of annual take is exceeded or is expected to be exceeded; new information reveals effects of the actions that may affect the ESA-listed species in a way not previously considered; a specific action is modified in a way that causes an effect on the ESA-listed species that was not previously considered; or a new species is listed or critical habitat is designated that may be affected by the action (50 CFR 402.16).

MAGNUSON-STEVENS ACT ESSENTIAL FISH HABITAT CONSULTATION

"Essential fish habitat" (EFH) is defined in section 3 of the Magnuson-Stevens Act (MSA) as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." NMFS interprets EFH to include aquatic areas and their associated physical, chemical, and biological properties used by fish that are necessary to support a sustainable fishery and the contribution of the managed species to a healthy ecosystem. EFH has been designated for Pacific salmon, groundfish, and coastal pelagic species. For information on EFH for these species, please see this website: http://www.nwr.noaa.gov/1habcon/habweb/msa.htm.

The MSA and its implementing regulations at 50 CFR 600.920 require a Federal agency to consult with NMFS before it authorizes, funds, or carries out any action that may adversely affect EFH—in this case, EFH for Pacific salmon, groundfish, and coastal pelagic species. The purpose of consultation is to develop a conservation recommendation(s) that addresses all reasonably foreseeable adverse effects to EFH. Further, the action agency must provide a detailed, written response to NMFS within 30 days of receiving an EFH conservation recommendation. The response must include measures proposed by the agency to avoid, minimize, mitigate, or offset the impact of the activity on EFH. If the response is inconsistent with NMFS' conservation recommendation the agency must explain its reasons for not following the recommendation.

However, in this instance, no conservation recommendations are necessary. As the Biological Opinion above describes, the proposed research actions are not likely, singly or in combination, to adversely affect the habitat upon which Pacific salmon, groundfish, and coastal pelagic species depend. All the actions are of limited duration, minimally intrusive, and are entirely discountable in terms of their effects, short-or long-term, on any habitat parameter important to the fish.

The action agencies must reinitiate EFH consultation if plans for these actions are substantially revised in a way that may adversely affect EFH, or if new information becomes available that affects the basis for the EFH conservation recommendations (50 CFR Section 600.920(k)).

The action agencies must reinitiate EFH consultation if plans for these actions are substantially revised in a way that may adversely affect EFH, or if new information becomes available that affects the basis for the EFH conservation recommendations (50 CFR Section 600.920(k)).

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